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of America and the present American Mathematical Society were organized in 1888, and in the intervening period have been established the large number of scientific societies which met together in New York during convocation week, and represented so impressively the development and differentiation of science in America.

DR. CAMPBELL'S PRESIDENTIAL ADDRESS ON THE NEBULÆ BEFORE THE AMERICAN ASSOCIATION

There were printed on the official program of the association the titles of some fourteen hundred papers to be given at the meeting. Among this large number the address of the president of the association, Dr. W. W. Campbell, director of the Lick Observatory, may be selected for notice, not only owing to its official character, but also for its intrinsic interest. The discoveries of astronomy make a strong appeal to the imagination, and it is noteworthy that this least practical of all the sciences is the one which in America has been cultivated beyond all the others, so that the work of the great American observatories is not paralelled elsewhere.

Readers of this journal are familiar with Dr. Campbell's work on the evolution of stars and on comets through the admirable papers we have had the privilege of printing in recent numbers. His presidential address was on the nebulæ, to which Sir William Herschel, towards the end of the eighteenth century, gave the first serious study. In 1845, it was determined by Lord Ross's reflecting telescope that some nebulæ are of spiral structure, evidence that they are in rapid rotation. In 1864, William Huggins discovered that the spectra of certain nebulæ prove that they are masses of gases, shining by their own light. The fourth event recorded by Dr. Campbell was the discovery by Keeler, beginning in 1898 at the Lick Observatory, that the great majority of nebulæ are spirals and that the Crossly reflecting telescope that he used could discover at least one hundred thousand nebulæ in the sky.

Dr. Campbell explained—his clear exposition was throughout accompanied by striking and beautiful photographs—that of about fifteen thousand recorded nebulæ not over three hundred, that is, not more than one fiftieth, are in the one quarter of the sky which contains the Milky Way, and these include nearly all the planetary and large gaseous nebulæ. The other three quarters of the sky contains nearly fifteen thousand nebulæ, not counting the scores of thousands as yet unrecorded. Thousands of spiral nebulæ are known to exist, but not a single one has been found within the Milky Way.

Our stellar system is believed to occupy a limited volume of space, somewhat the shape of a very flat pocket watch, and we see the Milky Way as a bright band encircling the sky, because looking toward it we are looking out through the greatest depth of stars. There is reason to suspect that there is an immense amount of obstructing material in our system, that would be most effective in its long dimensions. If such obstructions are operating upon the light of extremely faint and distant nebulæ, they should produce something like the distribution that is observed among the visible spiral nebulæ.

The probable mass of certain spirals is stupendous, some of them appearing to contain enough material to make thousands, and possibly millions, of stars comparable in mass with our sun. The spectra of some spirals have the characteristics that we should expect to find if they consisted chiefly of multitudes of stars. If we carried our spectrograph so far out into space that loking back our stellar system would be reduced to the aparent size of the spiral nebulæ, we should expect to see a spectrum similar to that yielded by the spirals. Dr. Campbell thus favors the hypothesis that the spiral nebulæ are enormously distant bodies, independent stellar systems in different degrees of development, independent of our own stellar system.

Dr. Campbell concluded his address with the remark: "Working at peace and under extreme encouragement, the astronomers are learning the place of our star and its planets among other stars. If the spiral nebulæ prove to be separate and independent systems, we shall bequeath to our successors the mighty problem of finding the place of our own great stellar system amongst the host of stellar systems which stretch throughout endless space."

SCIENTIFIC ITEMS

We record with regret the death of T. H. Bean, chief of the division of fish culture of the conservation commission of New York; of Clement Reid, F.R.S., late of the British Geological Survey; of A. M. Worthington, F.R.S., formerly professor of physics at the Royal Naval College, Greenwich, and of W. Ellis, F.R.S., formerly superintendent of the magnetical and meteorological department of the Greenwich Observatory.

At the recent New York meeting of the American Association for the Advancement of Science Dr. Theodore W. Richards, director of the Wolcott Gibbs Memorial Laboratory, Harvard University, was elected to preside at the meeting to be held next year at Pittsburgh and to give the address the following year in Boston.

Other presidents of scientific societies elected at the recent meetings are Professor George H. Shull, professor of botany in Princeton University, of the American Society of Naturalists; Professor Frederic S. Lee, of Columbia University, of the American Physiological Society; Professor Robert M. Yerkes, of Harvard University, of the American Psychological Association, and Professor Frank D. Adams, of McGill University, of the Geological Society of America.

Professor M. I. Pupin, of Columbia University, has been elected president of the New York Academy of Sciences, which in 1917 will celebrate its hundredth anniversary.—The Bruce gold medal of the Astronomical Society of the Pacific for the year 1917 has been awarded to Professor E. E. Barnard, of the Yerkes Observatory, for his distinguished services to astronomy.—Governor Whitman, of New York, has granted Dr. Hermann M. Biggs, state health commissioner, leave of absence to go to France, at the request of the Rockefeller Foundation, to conduct an organized campaign to combat the spread of tuberculosis among noncombatants.—Mr. Theodore Roosevelt made the principal address at the opening of the New York State Museum at Albany on the evening of December 29, his subject being "Productive Scientific Scholarship." The address was printed in the issue of *Science* for January 5. Among those who made addresses at the afternoon exercises were Dr. John H. Finley, president of the University of the State of New York; Dr. Charles D. Walcott, secretary of the Smithsonian Institution, and Dr. John M. Clarke, director of the State Museum.

The Naples Table Association for Promoting Laboratory Research by Women announces the offer of the Ellen Richards Research Prize of $1,000 for the best thesis written by a woman embodying new observations and new conclusions based on independent laboratory research in biology (including psychology), chemistry or physics. Theses offered in competition must be in the hands of the chairman of the committee on the prize before February 25, 1917. Application blanks may be obtained from the secretary, Mrs. Ada Wing Mead, 283 Wayland Avenue, Providence, R. I. The Sarah Berliner Research Fellowship for Women of the value of $1,000 is offered annually, available for study and research in physics, chemistry or biology. Applicants must already hold the degree of doctor of philosophy or be similarly equipped for the work of further research. Applications must be received by the first of February of each year. Further information may be obtained from the chairman of the committee, Mrs. Christine Ladd-Franklin, 527 Cathedral Parkway, New York.